AMS-02 Project Manager Introduction

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Prepared
19 August, 2008

Alpha Magnetic Spectrometer

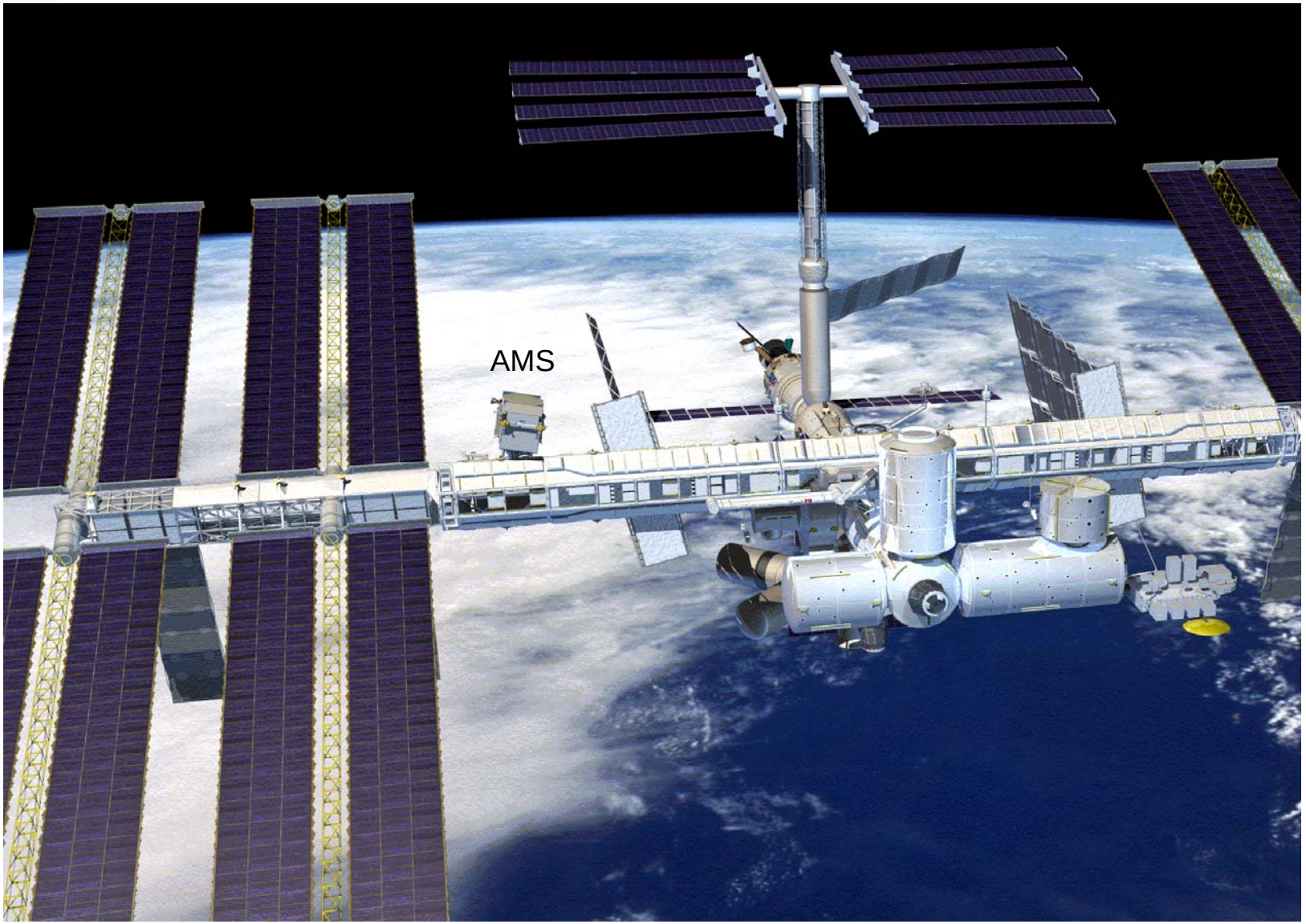
- Description
  - AMS-02 is a high energy physics experiment that employs a unique, superconducting electromagnet (SFHe @ 2 K) to produce a strong, uniform magnetic field (~0.8 Tesla) combined with a state-of-the-art precision spectrometer to search for anti-matter (anti-helium and anti-carbon), dark matter, dark energy and to understand Cosmic Ray propagation.
- Investigators:
  - The AMS team, led by Nobel laureate Prof. Samuel Ting/MIT, has approximately 200 physicists from multiple countries participating.
  - USA sponsorship by the U.S. Department of Energy.
  - Flown under a NASA / DOE interagency agreement (9/95) for two flights: Engineering Test on Shuttle (STS-91) and 3 yr Science Mission on ISS.
  - NASA/JSC Engineering Directorate is assigned Project Management and Payload Integration task (AMS Project Office/Engineering Directorate)

Review History

- Design Reviews
  - PDR – June 2000 – Successfully Completed
  - CDR – May 2005 – Successfully Completed
- Flight Safety Reviews
  - Phase O/I – Jan. 2001 – Successfully Completed
  - Phase II – May 2007 – Successfully Completed
  - Phase III – TBD – 12 months prior to launch
- Ground Safety Reviews
  - Phase O/I – Mar. 2002 – Successfully Completed
  - Phase II – Sept. 2008 – In Process
  - Phase III – TBD – 2-3 Months prior to arrival at KSC for ground processing

Flight Status

- AMS was manifested prior to November 2005 when the Shuttle manifest was reduced by 10 flights
- NASA HQ has requested that my office continue to process the payload for launch on a Shuttle
- No current shuttle launch opportunity exists
- There is speculation, based on recent congressional activity, that AMS could potentially be added to an existing flight or that a new flight could be added for AMS. No decision has been made by NASA HQ.


AMS

AMS Project Functional Organization Chart

Department of Energy (DOE)

Div. of High Energy Physics
Dr. D. Kovar

NASA Headquarters

Space Operations Mission Directorate

AMS Program Manager
Mr. M Sistilli

National Aeronautics and Space Administration

AMS Experiment Collaboration
Prof. S. C. C. Ting (MIT)

Johnson Space Center

Engineering Directorate (EA)

EA3 Project Executive
Mr. S. Porter

AMS Project Manager
Mr. T. Martin

AMS Deputy PM
Mr. K. Bollweg

S&MA Office

Q&MA Liaison
Mr. W. Bostick

ISS / Space Shuttle Program

Payload Integration Manager
Mr. C. Chang / ISS
Ms. P. Grounds / SSP

Jacobs Engineering / ESCG

NASA Contract Payload Integration

Project Manager
Mr. C. Tutt

Deputy PM
Mr. M. Fohey

KSC

Mission Resource Manager
Mr. J. Keifenheim

NASA /AMS International Operations

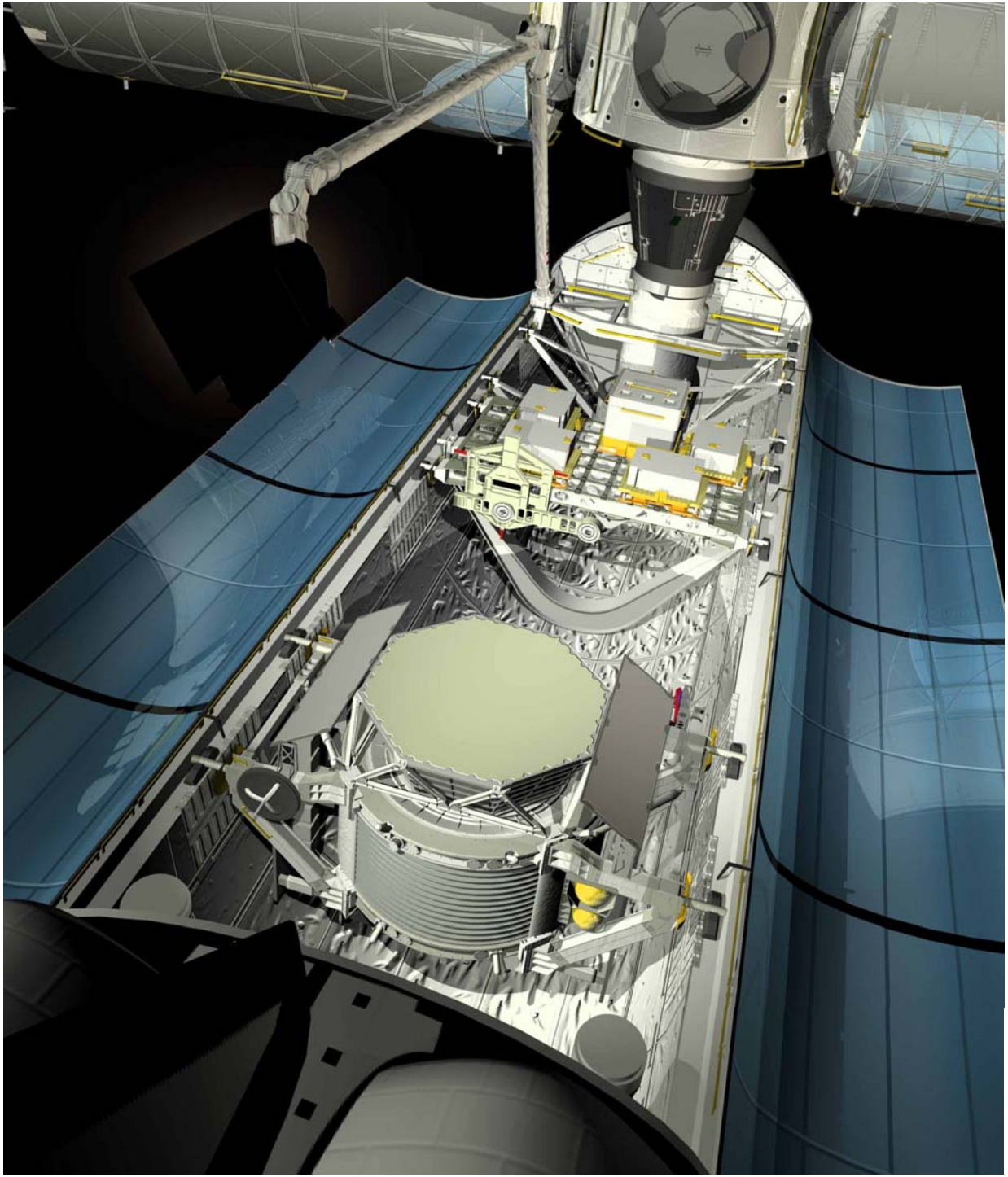
Payload Integration and Test Manager
Mr. K. Bollweg

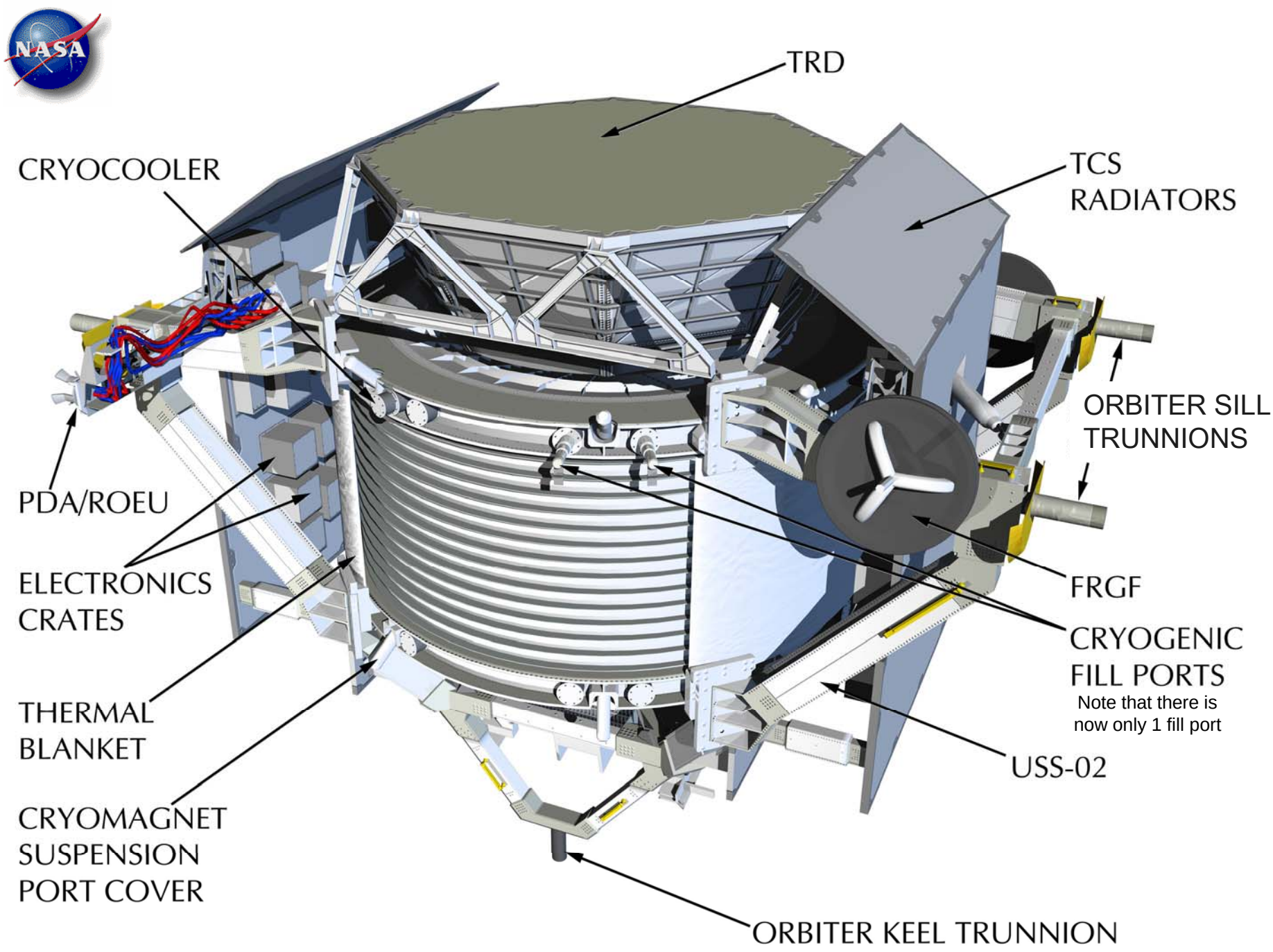
Updated: March 17, 2008

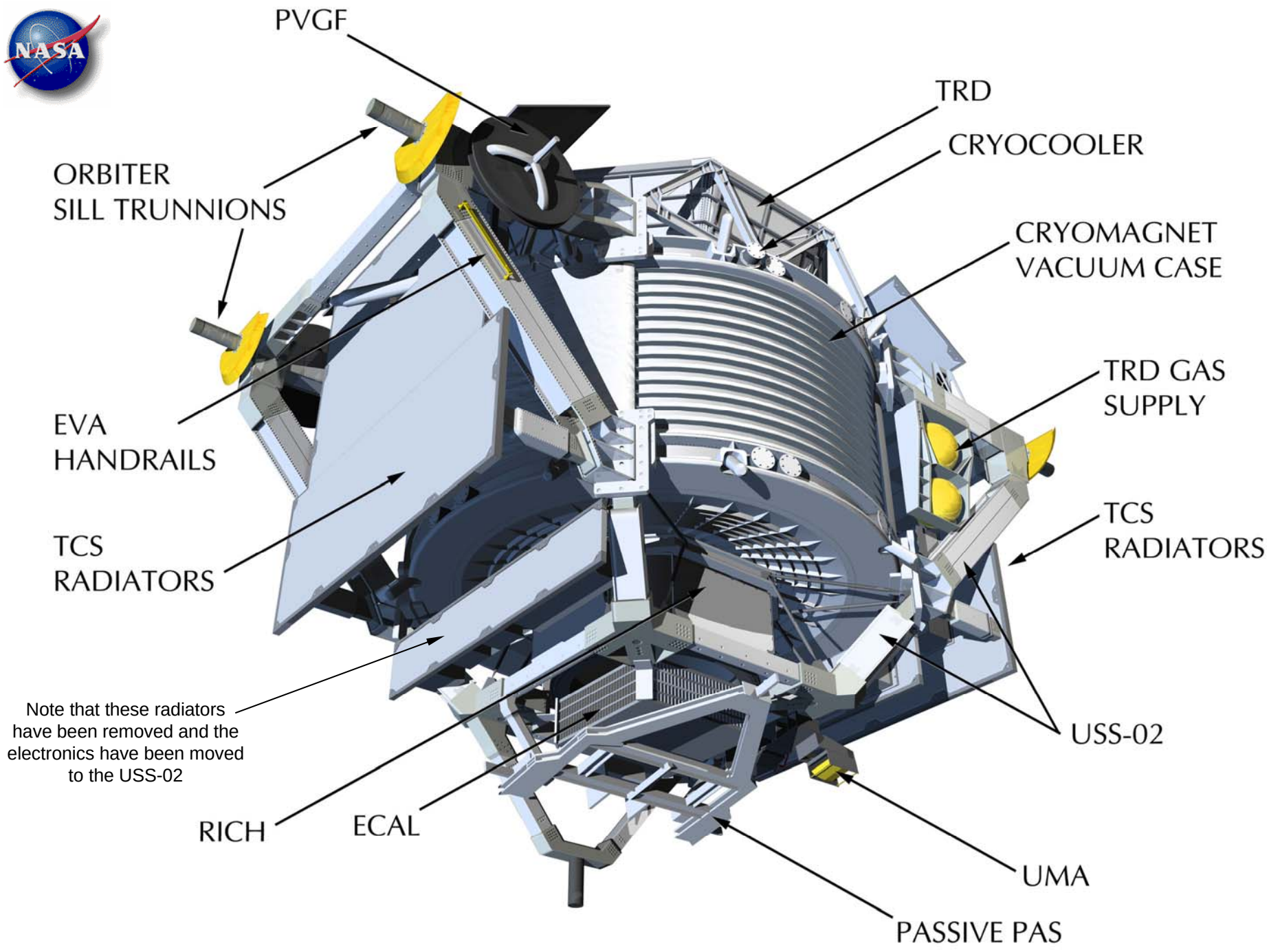
AMS Top Level Specifications

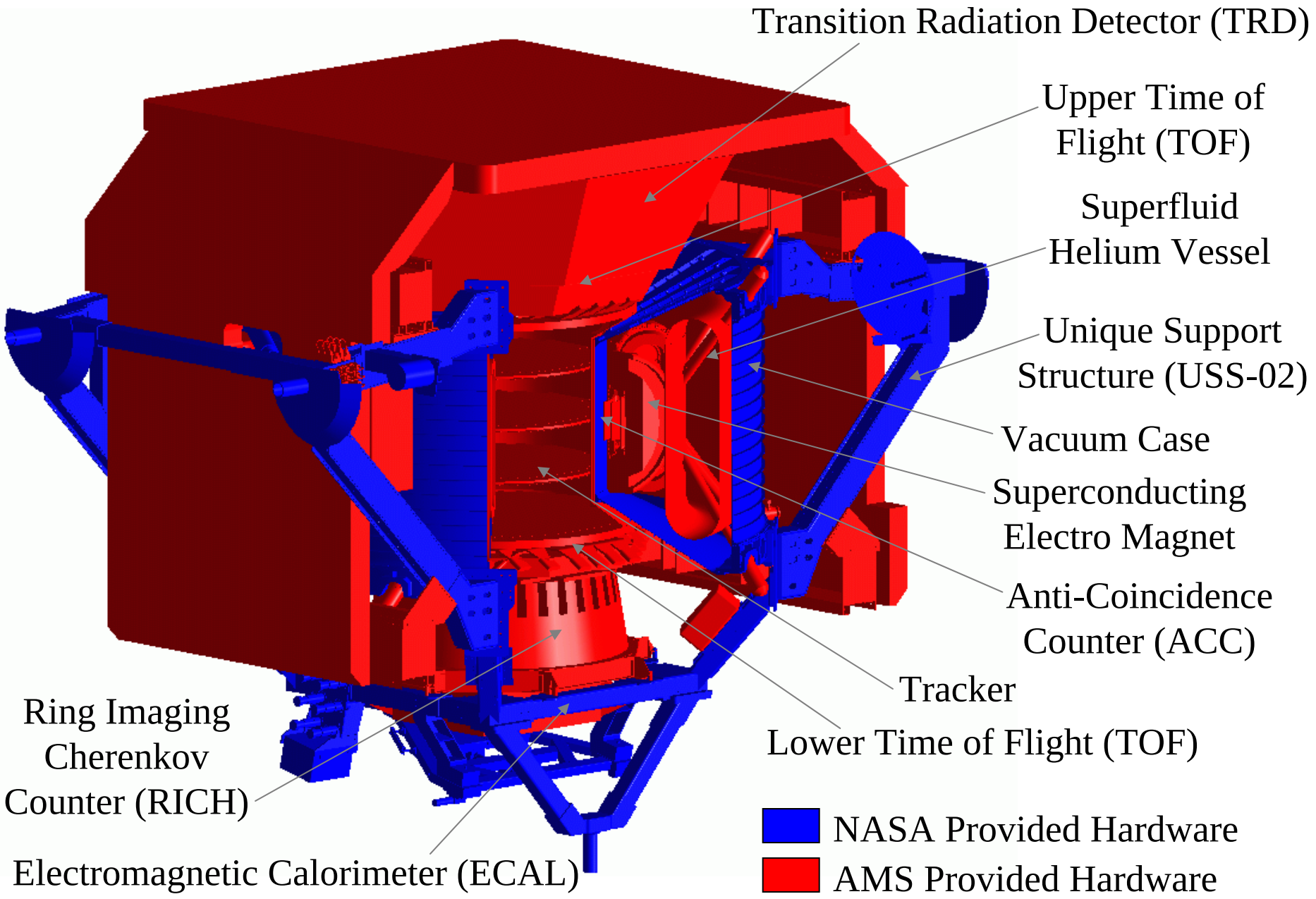
	AMS Unpress	STS Cabin
Upmass	15,100 lbs	72 lbs
Volume	¼ Bay Payload	2 ft^3
Power	2,400 W Cont. (ISS & STS)	60 W Cont. (STS)
	2,800 W Peak (ISS)	
High-rate Data	2 Mbps (can burst up to 20 Mbps)	2 Mbps
Crew Time	Robotic only during install	>10 Hrs Total

Magnetic Field	8500 G Center of Magnet, 2000 G Max Fringe Field at VC
	(1400 G Center of Magnet on AMS-01)

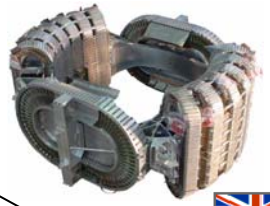



TRD
CRYOCOOLER
TCS
RADIATORS
ORBITER SILL
TRUNNIONS
PDA/ROEU
ELECTRONICS
CRATES
FRGF
CRYOGENIC
FILL PORTS
Note that there is
now only 1 fill port
THERMAL
BLANKET
USS-02
CRYOMAGNET
SUSPENSION
PORT COVER
ORBITER KEEL TRUNNION


PVGF
TRD
CRYOCOOLER
ORBITER
SILL TRUNNIONS
CRYOMAGNET
VACUUM CASE
TRD GAS
SUPPLY
EVA
HANDRAILS
TCS
RADIATORS
TCS
RADIATORS
Note that these radiators have been removed and the electronics have been moved to the USS-02
USS-02
RICH
ECAL
UMA
PASSIVE PAS


Transition Radiation Detector (TRD)
Upper Time of Flight (TOF)
Superfluid Helium Vessel
Unique Support Structure (USS-02)
Vacuum Case
Superconducting Electro Magnet
Anti-Coincidence Counter (ACC)
Tracker
Lower Time of Flight (TOF)
Ring Imaging Cherenkov Counter (RICH)
Electromagnetic Calorimeter (ECAL)
NASA Provided Hardware
AMS Provided Hardware

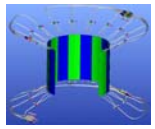
Superconducting Magnet



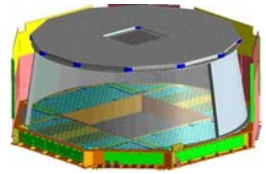
TOF

TRD

ACC



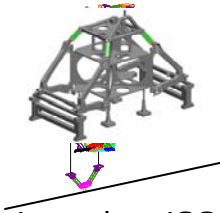
RICH



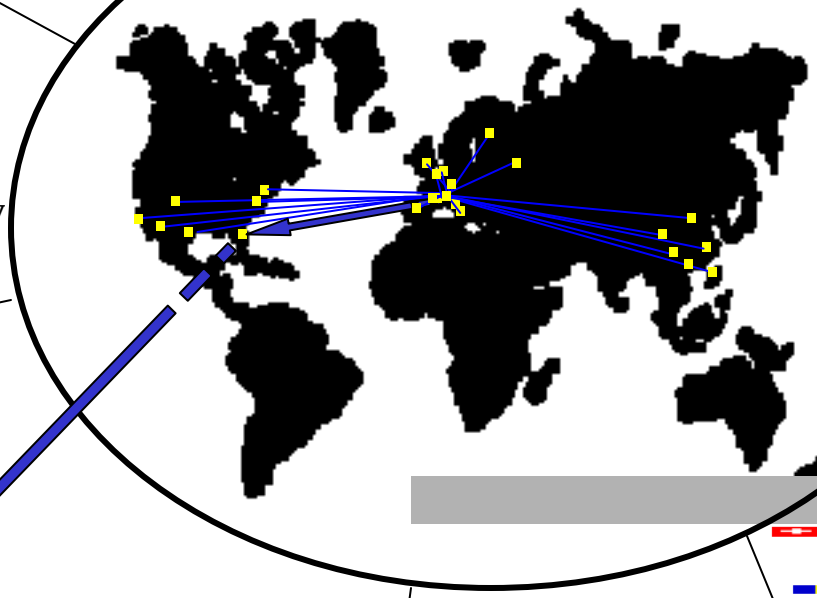
Vacuum Cases

ECAL

USS-02



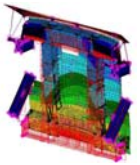
Safety Responsibility



Launch to ISS

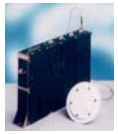
Electronics

TCS



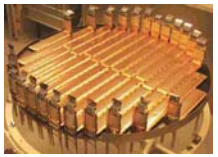
AMS on ISS

GPS



Star Tracker

Tracker



Pre-Launch, Launch & Operations

Baseline Nominal Operations

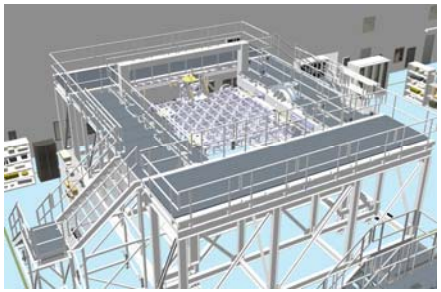
Offline Processing

~3 weeks

- Payload and GSE arrives by plane at KSC landing strip
- Some hardware will arrive by truck or hand carried
- Lower USS and STS/ISS integration hardware will be attached in SSPF
- SFHe tank will be filled during offline processing
- Magnet will be charged during offline processing
- Detectors will be checked to ensure no changes during transportation

Online Processing

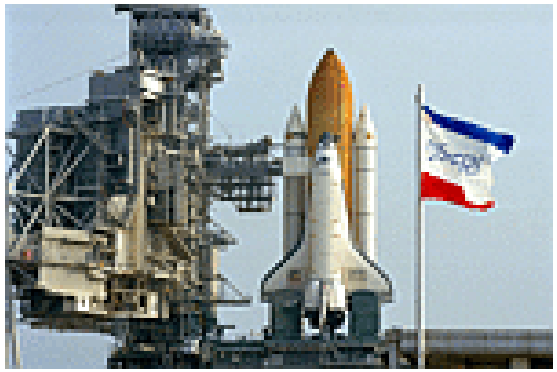
~3 months



- AMS will be handed over to KSC for online processing at SSPF
- AMS will be placed in ELC Rotation Stand and tested with the PRCU
- AMS Payload Attach System Interfaces, Umbilical Mechanism Assembly interfaces, and External Berthing Camera System alignment will be checked
- Payload weight will be checked (must be as close to full on SFHe as possible)
- Payload placed in Canister, rotated, and sent to pad
- SFHe tank topoff will be continuous in PCR

Baseline Nominal Operations

Prelaunch – Payload Bay



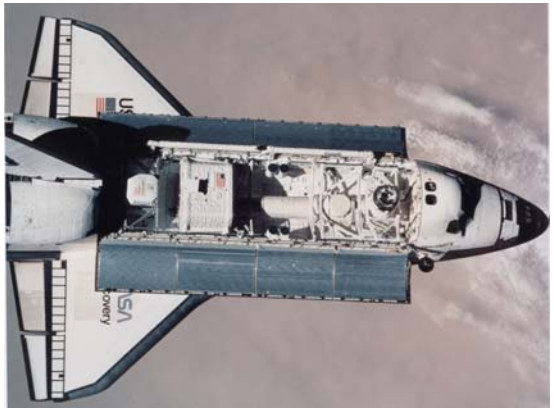
- T0 Umbilical power for Vent Pump, Cryocoolers, Valves, CAB, Critical monitoring functions & J Crate
- SFHe Tank Top off complete at L-88 hours
- Magnet will not be charged in Shuttle
- L-30 Minutes – Close SFHe Tank vent valve and deactivate vent pump and cryocoolers
- Continuously monitor health status of cryosystem until L-9 minutes
- L-9 Minutes – Go/No Go call from AMS

Ascent

- Launch – T0 Disconnect
- SFHe Tank nominal vent valve operations during ascent utilizing barometric switch with backup BFS GPC Command

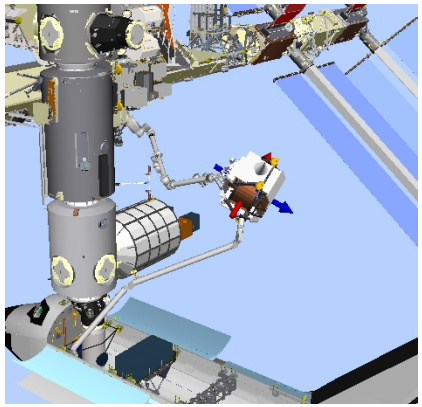
Baseline Nominal Operations

On-Orbit STS Operations



- Power up experiment (Max - 2kW)
- Activate and thermally condition experiment
- Magnet cannot be charged in Shuttle because it cannot receive power
- Dock to ISS on MET Day 3

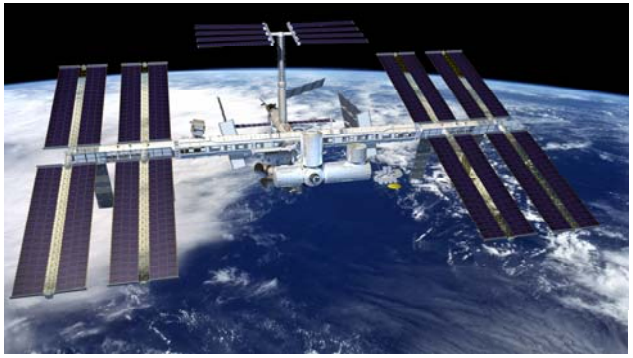
Transfer



- Give Go/No-Go call to transfer AMS
- Grapple AMS FRGF with SRMS
- Disconnect Remotely Operated Electrical Umbilical (ROEU)
- Release longeron and keel trunnions
- Remove AMS from payload bay
- Handoff from SRMS (FRGF) to SSRMS (PVGF)
- Place AMS on S3 Upper Inboard Payload Attach Site using External Berthing Cues System (EBCS)
- Attach AMS mechanically with PAS and electrically with UMA

Baseline Nominal Operations

On-Orbit ISS Operations



- Activate Experiment
- Charge Magnet
- Stay/No Stay Decision from AMS before Shuttle leaves
- ~3 Years of Continuous Operations with magnet charged. Science data still possible once magnet runs out of SFHe.
- Primary control from ground
- Crew interface available through Express Rack Laptop (nominal ops require very little crew involvement)